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Certificate
PATENT OFFICE
REPUBLIEK VAN SUID-AFRIKA
DEPARTMENT OF TRADE
AND INDUSTRY

Hiermee word gesertifiseer dat
This is to certify that

the documents annexed hereto are true copies of:

Application form P.1, provisional specification and drawings of South African Patent Application No. 2002/4480 as originally filed in the Republic of South Africa on 5 June 2002 in the name of JOYNT, Vernon Peregrin for an invention entitled: " METHOD AND APPARATUS FOR INFLUENCING THE DIRECTION OF AN EXPLOSIVE BLAST";

AND it is further certified that Patent Application No. 2002/4480 and the invention forming the subject matter of the patent application, together with all priority rights flowing from the patent application under the provisions of the International Convention were duly assigned in accordance with law from JOYNT, Vernon Peregrin to CSIR by virtue of a Deed of Assignment which was duly registered at the Patent Office, Pretoria, on 5 December 2002.

Geteken te PRETORIA in die Republiek van Suid-Afrika, hierdie 4th dag van June 2003
Signed at PRETORIA in the Republic of South Africa, this 4th day of June 2003

Registrateur van Patente
Registrar of Patents

PRIORITY DOCUMENT
SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH RULE 17.1(a) OR (b)

Schedule 2

Form P1

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

APPLICATION FOR A PATENT AND ACKNOWLEDGEMENT OF RECEIPT

[Section 30(1) – Regulation 22)]

REGISTRAR OF PATENTS, DESIGNS, TRADE MARKS AND COPYRIGHT
Revenue st
4 2002
Official date
R50 R10

The granting of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplic.
(i)

Official Application No.:		
21	01	2002/4480

(ii)

Applicant's or agent's reference

71	Full name(s) of applicant(s):	~~VERNON PEREGRIN JAMP~~ AANSOEKERS VERVANG APPLICANTS SUBSTITUTED CSIR 5-12-2002

(iii)

	Address(es) of applicant(s):	33 GOLF STREET WATERKLOOF, PRETORIA GAUTENG, REPUBLIC OF SOUTH AFRICA

(iv)

54	Title of invention	METHOD AND APPARATUS FOR INFLUENCING THE DIRECTION OF AN EXPLOSIVE BLAST

(v)

	The applicant claims priority as set out on the accompanying form P2. The earliest priority claimed is: Country: No: Date:			
(vi)				
	This application is for a patent of addition to Patent Application No.	21	01	
(vii)				
	This application is a fresh application in terms of section 37	21	02	
(viii)				
	This application is accompanied by:			

- ☒ A single copy of a provisional or two copies of a complete specification of 7 pages.
- ☒ Drawings of 1 sheets.
- ☐ Publication particulars and abstract (form P8 in duplicate).
- ☐ A copy of Figure _____ of the drawings (if any) for the abstract.
- ☐ An assignment of the invention.
- ☐ Certified priority documents (state number).
- ☐ Translation of the priority documents.
- ☐ An assignment of the priority rights
- ☐ A copy of Form P2 and the specification of S.A. Patent application No.
- ☒ Form P2 in duplicate
- ☐ A declaration and power of attorney on Form P3.
- ☐ Request for antedating on Form P4.
- ☐ Request for classification Form P9
- ☐ Request for delay of acceptance Form P4
- ☐ Extra copy of informal drawings (complete only)

21	01	

74	Address for service: ~~Rooth & Wessels Inc, Church Square, Pretoria~~ Adams & Adams

Dated this 4TH day of JUNE 2002

Applicant's Patent Attorney

The duplicate will be returned to the applicant's address for service as proof of lodging but is not valid unless endorsed with official stamp.

Received
Official date stamp
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2002-06-05
Registrar of Patents
REGISTRATEUR VAN PATENTE, MODELLE, HANDELSMERKE EN OUTEURSREG

Form P6

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

PROVISIONAL SPECIFICATION

(Section 30(1) – Regulation 27)

Official application No.:	
21	01 2002/4480

Lodging date:	
22	2002 -06- 05

Full name(s) of applicant(s):	
71	~~VERNON PEREGRIN JOYNT~~ SOEKERS VERVANG APPLICANTS SUBSTITUTED CSIR 5-JR-2002

Full name(s) of inventor(s):	
72	**VERNON PEREGRIN JOYNT**

Title of invention:	
54	**METHOD AND APPARATUS FOR INFLUENCING THE DIRECTION OF AN EXPLOSIVE BLAST**

This invention relates to apparatus for and a method of influencing the direction of an explosive blast. More particularly, this invention relates to apparatus for and a method of influencing the direction of an explosive blast, the apparatus being attachable to a motor vehicle and it further relates to a motor vehicle including with such apparatus.

The explosive effect of a landmine which is buried in soil differs considerably from the explosive effect of an explosive charge located on a surface and the difference is even greater when compared to the explosive effect of an explosion in free air.

Because the soil surrounding a buried landmine influences the blast characteristics of the explosion, the blast direction is very unpredictable. High speed filming of buried landmine explosions has revealed streaks of soil and gases emanating from the explosion, all substantially within an inverted cone volume of approximately 60 degrees. Research has also shown a uniform or gradient of energy across this cone.

The actual direction of the blast within this cone is, however, entirely unpredictable. This has resulted in the adoption of the concepts of "lucky" and "unlucky" landmine victims. Specifically, a blast direction may, for example, be fatal or severely damaging to a vehicle or it may be directed away form the vehicle, causing little or no damage.

Various conventional techniques are employed to protect vehicles form landmine explosions and these techniques are primarily directed at improving the survivability of the occupants of such vehicles. Often, some reduction in vehicle damage is also obtained but this is usually regarded as fortuitous. Some of these conventional techniques include: the fitting of deflection plates to a vehicle to deflect the explosive force; employing specially shaped and

constructed bodywork or hulls which deflect the explosive force; the addition of strengthening members or supporting members to bodywork; the moving of conventional wheel positions on a vehicle; filling the wheels of a vehicle with water of other energy absorbing liquids. These liquids absorb energy from an explosion, thus reducing the blast effect. Through a process of evaporation of the liquid during the explosion, the temperature and pressure of the hot gases of the explosion is reduced. Liquid filled tyres will also deflect the direction of the blast during a landmine explosion.

These methods all suffer from various shortcomings and it is an object of the present invention to provide a method and apparatus for influencing the blast direction of a landmine explosion. The invention further provides damage protection to a vehicle to which it is fitted.

According to one aspect of the invention, there is provided a method of influencing the direction of an explosive blast, the method including the step of locating media of different densities in the path of an explosive shock wave emanating from the blast travels, in use. The method may include the step of orientating the media so that a substantially planar interface is defined between the media, which interface is orientated generally obliquely relative to the direction of the explosive blast.

According to a further aspect of the invention, there is provided apparatus for influencing the direction of an explosive blast, the apparatus including elements of different density located in the path of a shock wave emanating from the blast, in use.

In a preferred form of the invention, media of different density may be located inside a vehicle wheel for influencing the direction of the blast relative to the wheel.

Preferably, the wheel includes an annular insert of closed cell foam material located within a tyre or tube element thereof, with space not occupied by the annular member being occupied by a liquid. The liquid may be water.

The insert may be generally triangular in cross section and is preferably located in the tyre with one face of the triangular cross section orientated to direct a shock wave emanating from a surface on which the wheel rests, in use, laterally from its path. In a preferred form of the invention, the shock wave is directed away from a vehicle to which the wheel is mounted, in use.

It will be appreciated that when a shock wave travels through a medium and into a medium of lesser density, the interface between the two media has a mirror effect on the shock wave, deflecting or re-directing the shock wave from its path in a manner very similar to a mirror deflecting a beam of light.

The wheel may include a rim having an outwardly projecting flange located on a side of the wheel which faces towards a vehicle on which it is mounted, in use.

The flange assists in directing the explosive blast away from the vehicle.

According to further aspects of the invention, there is provided a vehicle wheel having a triangular closed cell foam insert located within a tyre of the wheel; and a vehicle which includes a wheel as defined above.

One embodiment of this invention will now be described in more detail with reference to the accompanying drawing, which is a schematic sectioned view of a vehicle wheel according to the invention.

In the drawing, a wheel 10 for a vehicle (not shown) includes a steel rim 12 on which a tyre 14 is mounted. A cavity 16 defined within the tyre 14 contains an annular insert 18 which is manufactured of a closed cell foam material. It will be seen that the insert 18 generally has a triangular cross-section and one of its faces 18.2 is orientated such that it deflects, in use, a shock wave outwardly as will be explained hereunder.

The cavity 16 is filled with water 20 once the insert is in place. Thus, two substances of different densities are located inside the tyre 12, namely water and the closed cell insert 18, which has a lower density than the water 20.

In use, when the wheel 10 rolls over a landmine 22, buried underneath the surface 24 of the ground 28, an explosion is initiated which causes a shock wave to travel generally in the directions indicated by the arrows A. When the shock wave reaches a density interface of the two substances, water 20 the foam 18, which interface is defined by the face 18.2 of the closed cell foam insert 18, it is deflected laterally as indicated by the arrows B. In practice, this would also be a direction which is generally away from the vehicle on which the wheel 10 is mounted.

A steel flange 30 is provided on the wheel as shown as an added deflection member. This flange 30 would also serve as a run-flat member for supporting the vehicle when the tyre 14 is flat.

It will be appreciated that many variations or modifications of the invention are possible without departing from the spirit of the disclosure.

It will further be appreciated that at the exit site of the shock wave, the shock energy may be used to project an object into the air, away from the vehicle. This object can be a metal plate or any other object that will travel with

sufficient velocity to provide a significantly lower pressure in the air through which it is projected. The slower mixture of expanding gases, soil and other material from the explosion follow this lowered pressure route away from the vehicle.

The projected object can be a piece of metal cut out of the rim of the wheel or it can even be a piece of shredded tyre.

A peripheral aspect of this invention concerns the design of a charge which will make the qualification of a mine resistant vehicle (MRV) in a blast test more reliable.

The principle described in this specification can also be employed to develop a test charge that will have more predictable performance in a qualification blast done to test a MRV or other mine protection equipment.

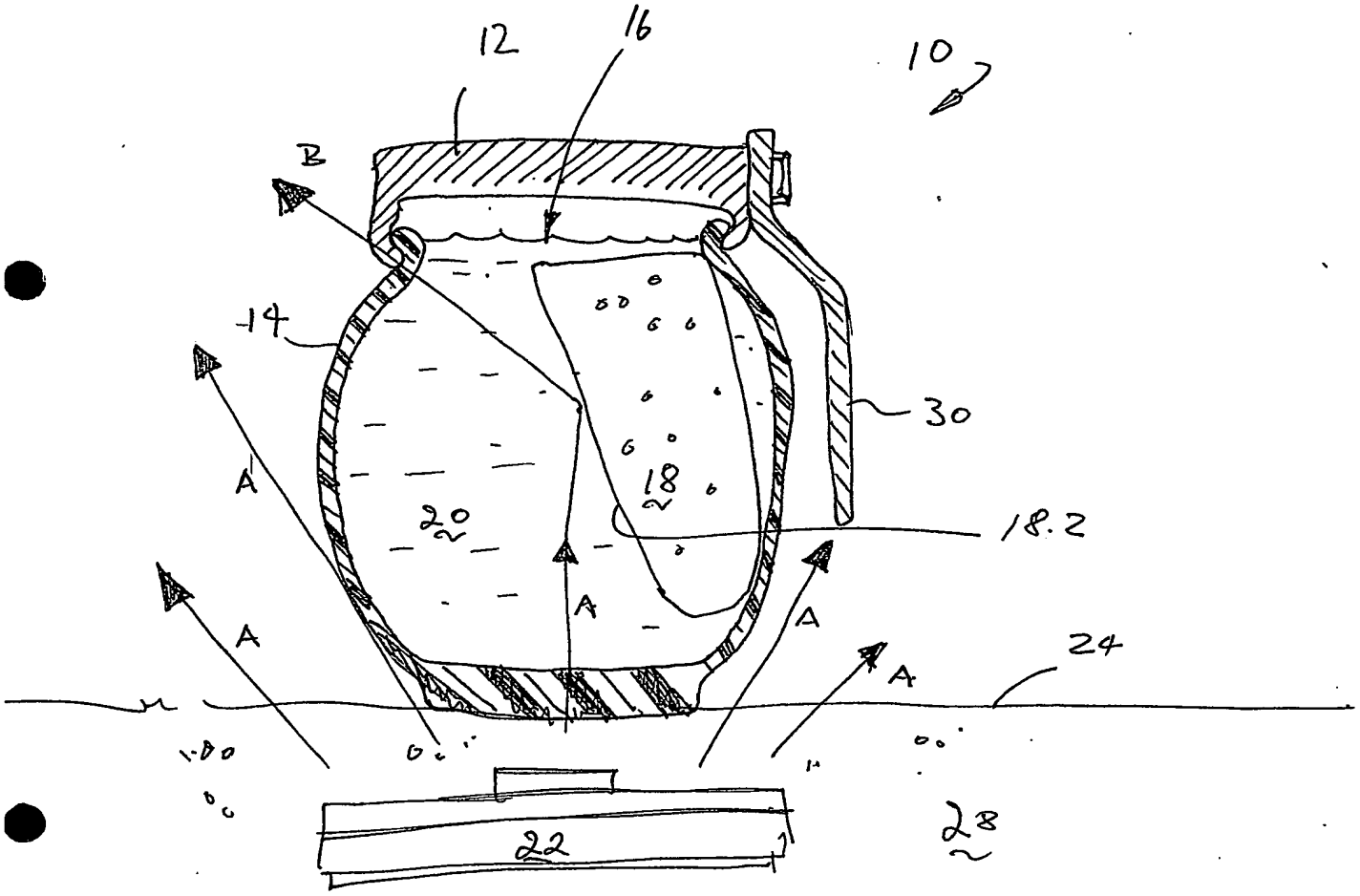
It is at present not possible to design a test charge which will predictably direct a high energy blast into the weakest spot of a vehicle for test purposes. Thus, a test charge design wherein a high density material area produces the lowered pressure route, as described above, towards the area of a vehicle which needs to be tested, will go a long way in enhancing test methods.

It is important that the test relates to the landmine protection level specified in the test. The energy streak designed for in the test charge must not exceed that for the highest variation the specified mine can produce.

The high density area may be made of various materials but the best would be brittle materials that would in their own right not damage the target.

DATED AT PRETORIA THIS 31st DAY OF MAY 2002.

PATENT ATTORNEY FOR THE APPLICANT



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